

## ROOT-KNOT DISEASE IN FLORIDA TOBACCO

J. R. Rich<sup>1</sup> and R. A. Dunn<sup>2</sup>

Introduction: Over 7,600 acres of flue-cured tobacco (Nicotiana tabacum L.) are grown annually in 21 North Central Florida counties (1). Root-knot nematodes (Meloidogyne spp.) are recognized as the major disease problem on Florida tobacco (4) with estimated losses of from 3 to 6% yearly.

History: The first report of plant-parasitic nematode problems in Florida flue-cured tobacco was that of Tisdale in 1927 (7), three years after widespread introduction of the crop into the state (8). Tisdale (7) indicated that root-knot nematodes produced considerable yield losses especially on sandy soils and during periods of dry weather. In heavily infested fields, plants were stunted and leaves appeared 'fired' early in the season (Fig. 1). With lighter infestations, tobacco growth was fair until flowering when 'fired' leaf symptoms appeared. Two of Tisdale's recommendations for root-knot nematode control (from vegetable work of Professor J. R. Watson (9)) are still widely recommended: late summer and fall fallow, and planting resistant or immune cover crops.

Symptoms: Root-knot nematode galls on roots of tobacco limit the efficiency at which the roots remove moisture and nutrients from the soil (Fig. 3). Above-ground symptoms of root-knot disease are similar to those caused by poor fertilization and moisture stress. Plants wilt prematurely on hot days and appear yellow and/or stunted. When high numbers of root-knot nematodes are present, tobacco leaves burn around the outer edges but stems stay green, causing reduced leaf quality. Symptoms are generally confined to spots in a field, but large areas may be affected. One should be aware that even in fields where few obvious symptoms occur, yield and quality loss may still be considerable.

Meloidogyne Species: M. arenaria, M. javanica, and M. incognita are the major species damaging tobacco in Florida (3,6) and in the U.S. (5) (Fig. 2). M. incognita was once considered to be the major root-knot nematode affecting tobacco in Florida; however, a survey in 1981 indicated that M. javanica was the most prevalent species on tobacco. M. javanica and M. incognita were found in 65 and 33% of the tobacco fields, respectively, while only 1% of the fields were found infested with M. arenaria. Data from Florida (6) indicate that M. javanica has increasingly displaced M. incognita as the major nematode problem on tobacco. Shorter rotation intervals and the use of M. incognita-resistant varieties have been suggested as causes for the increased prevalence of M. javanica. The increased prevalence of M. javanica in Florida flue-cured tobacco has resulted in greater losses. Tests have shown that M. javanica is more damaging than M. incognita (2), and that M. javanica caused 2-4 times greater yield loss than M. incognita. (Indications are that M. arenaria may be increasing in severity and has the potential of causing severe damage to tobacco.)

Management: Since Meloidogyne spp. are present in damaging numbers in virtually all Florida tobacco fields, they must be controlled to prevent losses from occurring (3). The first step is the use of nematode-free transplants. Transplants commercially produced in soilless mixes are becoming increasingly important. In the field, the three major management techniques are rotation, resistant varieties, and

<sup>1,2</sup>Research Nematologist and Extension Nematologist, respectively, Dept. of Entomology and Nematology, University of Florida, Gainesville, FL 32611.

nematicides. Crop rotation, preferably with graminaceous crops, should be used to keep populations low, but rotation alone cannot be expected to reduce populations below economically damaging levels. M. incognita-resistant cultivars are commonly planted in most Florida tobacco fields; but they reduce losses only to that species as this resistance has no effect on the other root-knot nematode species. Its use, in the absence of all other nematode management techniques, will inevitably lead to the development of damaging populations of the other species, especially M. javanica. Where available, the nematicides of choice are soil fumigants. With the limited availability of nematicides, the prospect of developing more damaging nematode populations by depending on resistance to M. incognita and the limited benefits of crop rotation make it necessary to integrate all of these practices into a long-range farm management plan in which they can complement each other for maximum nematode control.

#### LITERATURE CITED:

1. Anon. 1984. Field crops summary. Fla. Crop & Livestock Reporting Service, Orlando, FL. 1 p.
2. Arens, M. L., and J. R. Rich. 1981. Yield response and injury levels of Meloidogyne incognita and M. javanica on the susceptible tobacco cultivar 'McNair 944'. J.Nematol. 13:196-201.
3. Dunn, R. A., and J. R. Rich. 1984. Flue-cured tobacco nematicides and nematode resistant varieties. Univ. Fla. IFAS, NPPP #15, 4 pp.
4. Kucharek, T. A. 1984. Tobacco disease losses in Florida. In: Tobacco Disease Loss Evaluation Committee, 31st Tobacco Worker's Conf., 29 pp.
5. Lucas, G. B. 1975. Diseases of tobacco. 3rd Ed. Harold E. Parker & Sons, Fuquay-Varina, Raleigh, NC. 621 pp.
6. Rich, J. R., and R. Garcia M. 1985. Nature of the root-knot disease in Florida tobacco. Plant Disease (in press).
7. Tisdale, W. B. 1927. Suggestions for control of root-knot of tobacco. Fla. Exp. Station Press Bull. 401, 2 pp.
8. \_\_\_\_\_. 1928. Tobacco culture in Florida. Fla. Agr. Exp. Stat. Ann. Report, p. 379-428.
9. Watson, J. R., and C. C. Goff. 1937. Control of root-knot in Florida. Fla. Agr. Exp. Stat. Bull., pp. 311-322.



Fig. 1. Tobacco plants infected with root-knot nematodes.



Fig. 2. L to R: Meloidogyne incognita, M. arenaria, and M. javanica that attack tobacco and the relative damage of each.